



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of

Yukio SHAKUDA

Application No.: 09/604,097

Filed: June 27, 2000

For: SEMICONDUCTOR LIGHT EMITTING  
DEVICE AND MANUFACTURING  
METHOD THEREFOR

Group Art Unit: 2874

Examiner: Unassigned

**INFORMATION DISCLOSURE STATEMENT**  
**TRANSMITTAL LETTER**

Assistant Commissioner for Patents  
Washington, D.C. 20231

Sir:

Enclosed is an Information Disclosure Statement and accompanying form PTO-1449 for the above-identified patent application.

- ☒ No additional fee for submission of an IDS is required.
- ☐ The fee of \$180.00 (126) as set forth in 37 C.F.R. § 1.17(p) is also enclosed.
- ☐ A certification under 37 C.F.R. § 1.97(e) is also enclosed.
- ☐ A certification under 37 C.F.R. § 1.97(e), and the fee of \$180.00 (126) as set forth in 37 C.F.R. § 1.17(p) are also enclosed.
- ☐ Charge \$\_\_\_\_\_ to Deposit Account No. 02-4800 for the fee due.
- ☐ A check in the amount of \$\_\_\_\_\_ is enclosed for the fee due.

The Commissioner is hereby authorized to charge any appropriate fees under 37 C.F.R. §§ 1.16, 1.17 and 1.21 that may be required by this paper, and to credit any overpayment, to Deposit Account No. 02-4800. This paper is submitted in duplicate.

Respectfully submitted,

BURNS, DOANE, SWECKER & MATHIS, L.L.P.

By:

Ellen Marcie Emas  
Registration No. 32,131

P.O. Box 1404  
Alexandria, Virginia 22313-1404  
(703) 836-6620

Date: March 6, 2002

165



Patent  
Attorney's Docket No. 033022-004

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of )  
Yukio SHAKUDA ) Group Art Unit: 2874  
Application No.: 09/604,097 ) Examiner: Unassigned  
Filed: January 27, 2000 )  
For: SEMICONDUCTOR LIGHT EMITTING )  
DEVICE AND MANUFACTURING )  
METHOD THEREFOR )

SUPPLEMENTAL INFORMATION DISCLOSURE STATEMENT

Assistant Commissioner for Patents  
Washington, D.C. 20231

Sir:

In accordance with the duty of disclosure as set forth in 37 C.F.R. § 1.56, Applicant hereby submit the following information in conformance with 37 C.F.R. §§ 1.97 and 1.98. Pursuant to 37 C.F.R. § 1.98, a copy of each of the documents cited is enclosed.

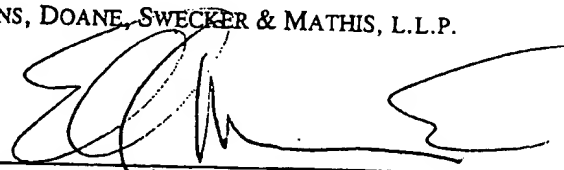
The documents are being submitted within 3 months of the filing or entry of the national stage of this application or before the first Office Action on the merits, whichever is later, therefore no fee or statement is required under 37 C.F.R. § 1.97(b).

To assist the Examiner, the documents are listed on the attached form PTO-1449. It is respectfully requested that an Examiner initialed copy of this form be returned to the undersigned.

Respectfully submitted,

BURNS, DOANE, SWECKER & MATHIS, L.L.P.

By:

  
Ellen Marcie Emas  
Registration No. 32,131

P.O. Box 1404  
Alexandria, Virginia 22313-1404  
(703) 836-6620  
Date: March 6, 2002

Substitute for form 1449A/PTO

SHEET 1 OF 3

# INFORMATION DISCLOSURE STATEMENT BY APPLICANT

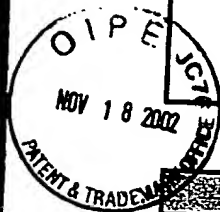
ATTORNEY'S DKT No.  
033022-004

APPLICATION No.  
09/604,097

APPLICANT  
Yukio Shakuda

FILING DATE  
June 27, 2000

GROUP  
2874



## U.S. PATENT DOCUMENTS

Examiner Initials	U.S. Patent Document		Name of Patentee or Applicant of Cited Document	Date of Publication (MM-DD-YYYY)
	Number	Kind Code (if known)		
	4,268,842		Jacob et al.	05/19/1981
	5,006,908		Matsuoka et al.	04/09/1991
	5,227,328		Khan et al.	07/13/1993
	4,144,116		Jacob et al.	03/13/1979
	5,252,499		Rothschild	10/12/1993
	4,904,618		Neumark	02/27/1990

## FOREIGN PATENT DOCUMENTS

Examiner Initials	Foreign Patent Document		Country	Date of Publication (MM-DD-YYYY)	Translation	
	Number	Kind Code (if known)			Yes	no
	0 483 688 A2		Europe	05/06/1992		
	0 541 373 B1		Europe	09/30/1998		
	WO 96/11498		WIPO	04/18/1996		

## NON PATENT LITERATURE DOCUMENTS

Examiner Initials	Include name of author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.
	NAKAMURA et al., "Thermal Annealing Effect of P-Type Mg-Doped GaN Films", Jpn. J. Appl. Phys. Vol. 31, (1992), pp. L139-L142
	WATANABE et al., "Annealing effect on the electrical properties of heavily C-doped p GaAs", Appl. Phys. Lett. 59 (4), July 22, 1991, American Institute of Physics
	Delphion, Intellectual Property Network, translation of U.S. 4,960,720
	AMANO et al., "Electron Beam Effects on Blue Luminescence of Zinc-Doped GaN", Journal of Luminescence 40 & 41 (1998), pp. 121-122, Elsevier Science Publishers B.V., North-Holland, Amsterdam
	MARUSKA et al., "The Preparation and Properties of Vapo-Deposited Single-Crystal Line GaN", Applied Physics Letters, Vol. 15, No. 10, November 15, 1969
	JOHNSON et al., "Hydrogen passivation of shallow-acceptor impurities in p-type GaAs", Physical Review B, Vol. 33, No. 2, January 15, 1986, The American Physical Society
	ANTELL et al., "Passivation of zinc acceptors in InP by atomic hydrogen coming from arsine during metalorganic vapor phase epitaxy",
	AKASAKI et al., "Photoluminescence of Mg-doped p-type GaN and electroluminescence of GaN p-n junction LED", Journal of Luminescence 48 & 49, pp. 666-670, Elsevier Science Publishers B.V., North-Holland
	KHAN et al., "P-type Conversion of Nitrogen Doped ZnSe Films Grown by MOCVD", pp. 251-256, Mat. Rse. Soc. Symp. Proc. Vol. 222, 1991, Materials Research Society
	LAKS et al., "Native defects and self-compensation in ZnSe", pp. 10 965 - 10 978, Vol. 45, No. 19, Physical Review B, Vol. 45, No. 19, May 15, 1992, The American Physical Society
	VAN DE WALLE et al., "Solubilities defect reactions and doping limits in ZnSe", pp. 704-709, Journal of Crystal Growth 117, 1992, Elsevier Science Publishers B.V., North Holland
	LAKS et al., "Role of Native Defects in Wide-Band Gap Semiconductors", pp. 648-651, Physical Review Letters, Vol. 66, No. 5, 1991 The American Physical Society
	NEUMARK et al., "Li Doped ZnSe and Problems of p-Type Conduction", pp. 189-194, Journal of Crystal Growth 59, 1982, North Holland Publishing Company
Examiner Signature	Date Considered

EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609; draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. SEND TO: Assistant Commissioner

Substitute for form 1449A/PTO

# INFORMATION DISCLOSURE STATEMENT BY APPLICANT

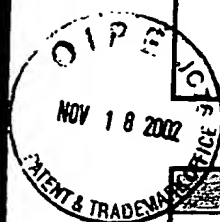
ATTORNEY'S DKT NO.  
033022-004

APPLICATION NO.  
09/604,097

APPLICANT  
Yukio Shakuda

FILING DATE  
June 27, 2000

GROUP  
2874



## U.S. PATENT DOCUMENTS

Examiner Initials	U.S. Patent Document		Name of Patentee or Applicant of Cited Document	Date of Publication (MM-DD-YYYY)
	Number	Kind Code (if known)		
	6,084,899		Shakuda	07/04/2000
	6,115,399		Shakuda	09/05/2000

## FOREIGN PATENT DOCUMENTS

Examiner Initials	Foreign Patent Document		Country	Date of Publication (MM-DD-YYYY)	Translation	
	Number	Kind Code (if known)			Yes	no

## NON-PATENT LITERATURE DOCUMENTS

Examiner Initials	Include name of author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.
	NEUMARK, "Effect of deep levels on semiconductor carrier concentrations in the case of "strong" compensation", pp. 2250-2252, Physical Review B, Vol. 26, No. 4, , 1982 The American Physical Society
	NEUMARK, "Are impurities the cause of "self"-compensation in large-band-gap semiconductors?", pp. 3383-3387, J. Appl. Phys. 51(6), June 1980, American Institute of Physics
	NEUMARK, "Achievement of Well Conducting Wide-Band-Gap Semiconductors: Role of Solubility and Nonequilibrium Impurity Incorporation", Physical Review Letters, pp. 1800 - 1805, Vol. 62, No. 5, 1989 The American Physical Society
	BOULOU et al., "Recombination Mechanisms in GaN:Zn", pp. 767-770, Journal of Luminescence 18/19 (1979), North-Holland Publishing Company
	FURTADO et al., "Study of the Influence of Annealing Effects in GaN VPE", pp. 257-267, Journal of Crystal Growth 64 (1983), North-Holland Publishing Company
	DESNICA et al., "Method of growing of p-type GaN in nonequilibrium conditions", pp. 4119-4120, Physical Review B, Vol. 15, No. 8, April 15, 1977
	BOULOU et al., "Cathodoluminescence Study of Zn Doped GaN", pp. 555-561, Revue de Physique Appliquee, November 13, 1978
	MADAR et al., "Growth Anisotropy in the GaN/Al <sub>2</sub> O <sub>3</sub> Sytem", pp. 239-251, Journal of Crystal Growth 49 (1977), North-Holland Publishing Company
	SHUTO et al., "Noncollinearly Phase-Matched Second Harmonic Generation in Stilbene-Dye-Attached Polymer Thin Films", pp. 2508-2512, Japanese Journal of Applied Physics, Vol. 28, No. 12, December 12, 1989
	PANKOVE, "Low-Voltage Blue Elctroluminescence in GaN", pp. 721-724, IEEE Transactions on Electron Device, Vol. Ed-22, No. 9, September 9, 1975
	PANKOVE, "Luminescence in GaN", Journal of Luminescence 7 (1977), pp. 114-126, North-Holland Publishing Company
	JACOB et al., "Optimized Growth Conditions and Properties of N-Type and Insulating GaN", Gallium Nitride, Vol. 11, No. 4, pp. 445-450
	VASILISHCHEV et al., "Gallium nitride diodes emitting dark blue to violet light", Sov. Phys. Semicond., Vol. 9, No. 9, pp. 1189-1190
	ZYKOV et al., "Influence of Temperature on the Luminescence Bands of Gallium Nitride", Soviet Physics - Semiconductor, Vol. 6, No. 1, pp. 154-156, July 1972
Examiner Signature	Date Considered

INFORMATION DISCLOSURE  
STATEMENT BY APPLICANTATTORNEY'S DKT NO.  
033022-004APPLICATION NO.  
09/604,097APPLICANT  
Yukio ShakudaFILING DATE  
June 27, 2000GROUP  
2874

NOV 18 2002

PATENT &amp; TRADEMARK OFFICE

U.S. PATENT DOCUMENTS						
Examiner Initials	U.S. Patent Document		Name of Patentee or Applicant of Cited Document	Date of Publication (MM-DD-YYYY)		
	Number	Kind Code (if known)				
FOREIGN PATENT DOCUMENTS						
Examiner Initials	Foreign Patent Document		Country	Date of Publication (MM-DD-YYYY)	Translation	
	Number	Kind Code (if known)			Yes	no
NON-PATENT LITERATURE DOCUMENTS						
Examiner Initials	Include name of author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.					
	JACOB et al., "Gallium Nitride Emitting Devices Preparation and Properties", Journal of Electronic Materials, Vol. 7, No. 4, pp. 499-514, 1978 AIME					
	PANKOVE et al., "Photoluminescence of Zn-implanted GaN", Appl. Phys. Lett., Vol. 24, No. 6, pp. 281-283, March 15, 1974					
	METCALFE et al., "Cathodoluminescence from Gallium Nitride Implanted with Arsenic or Phosphorous", Journal of Luminescence 16 (1978) pp. 405-415, North-Holland Publishing Company					
	WILSON et al., "Implantation and Redistribution of Dopants and Isolation Species In GaN and Related Compounds", Solid-State Electronics, Vol. 38, No. 7, pp. 1329-1333, 1995 Elsevier Ltd., published in Great Britain					
	KARPINSKI et al., "Equilibrium Pressure of N <sub>2</sub> Over GaN and High Pressure Solution Growth of GaN", Journal of Crystal Growth 66 (1984), pp. 1-10					
	ZOLPER et al., "Ion Implantation and Rapid Thermal Processing of III-V Nitrides", Journal of Electronic Materials, Vol. 27, No. 5, pp. 839-844					
	STRITE et al., "GaN, AlN, and InN: A review", Critical Review, J. Vac. Sci. Technol. B, Vol. 10, No. 4, pp. 1237-1265, Jul/August 1992, American Vacuum Society					
	DMITRIEV et al., "Three-color blue-green-red display made from one single crystal", Sov. Tech. Phys. Lett. 12(5), p. 221, May 1986					
	PANKOVE et al., "Photoluminescence of ion-implanted GaN", Journal of Applied Physics, Vol. 47, No. 12, pp. 5387-5390, December 12, 1976, American Institute of Physics					
	PEARTON et al., "Ion implantation doping and isolation of GaN", Appl. Phys. Lett. 67 (10), pp. 1435-1437, September 4, 1995					
	LEE et al., "Hydrogen passivation of Ca acceptors in GaN", Appl. Phys. Lett. 68 (15), pp. 2102-2104, April 8, 1996, American Institute of Physics					
	WILSON et al., "Thermal stability of implanted dopants in GaN", Appl. Phys. Lett., Vol. 66, No. 17, pp. 2238-2240, April 24, 1995					
	BINARI et al., "H, He, and N implant isolation of n-type GaN", J. Appl. Phys. 78 (5), pp. 3008-3011, September 1, 1995, American Institute of Physics					
	ZOLPER et al., "Ca and O ion implantation doping of GaN", Appl. Phys. Lett. 68 (14), pp. 1945-1947, April 1, 1996, American Institute of Physics					
	HERRES et al., "Effect of interfacial bonding on the structural and vibrational properties of InAs/GaSb superlattices", Physical Review B, Vol. 53, No. 23, pp. 15 687-15 705, June 15, 1996					
	MARUSKA et al., "Violet luminescence of Mg-doped GaN", Appl. Phys. Lett. Vol. 22, No. 6, pp. 303-305, March 15, 1973, American Institute of Physics					
	Opposition papers of EP Patent Application No. 923101323					
	Notice of Opposition of EP 0.541.373, filed June 30, 1999 in EP Patent Office					
	Response letter to Oppositions by A.A. Thornton & Co., dated March 3, 2000					
Examiner Signature			Date Considered			

EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609; draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. SEND TO: Assistant Commissioner for Patents